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Population distribution of thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) in rose plant within different plant parameters

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Abstract
Investigation on "population distribution of thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) in rose plant within different plant parameters" was carried out at University of Agricultural Sciences, Bangalore during 2008. Out of the different plant parameters viz., young shoot, matured shoot, old shoot, unopened bud, calyx opened bud, matured flower, fully opened flower tested to sample thrips population in upper, middle and lower canopies, matured flower and young shoot (r = 0.96 and 0.90, respectively) were most preferred plant parts for the thrips sampling. They served as the best sampling unit. In polyhouse, fully opened flowers had maximum positive relationship (r= 0.94) compared to matured flower (r = 0.92). Regression equation also showed that matured flower and young shoot were the best representative of the thrips density and were reliable sampling unit. Hence, while sampling for thrips, matured flowers are most reliable parameter. However, during non-flowering time, young shoots can be taken for effective thrips count.

Keywords: Rose, Thrips, *Scirtothrips dorsalis*, population distribution, sampling unit, plant parameters

1. Introduction
Roses (*Rosa* spp.) are one of the most popular flowering shrubs in India and other countries. A large number of insects attack different parts of rose plants at every stage of growth. Most common pests are thrips, aphids, scales, chaffers, termites, whiteflies, leafhopper, mites, etc. [1, 7]. Among these pests, the sucking pests viz. thrips, aphids, whitefly and mites are considered as the major ones. Among the sucking pests, thrips is one of the serious pests of roses [8]. The larvae and adults of *Scirtothrips dorsalis* caused damage to all the stages of flower [6]. *S. dorsalis* alone can cause 28-95% damage with a population density of 11-33 thrips/flower [3]. To see the extent of damage by thrips and to sample the population in a particular location, it is necessary to know the distribution of the thrips within the plants to know which part should be sampled to get the realistic data on population of thrips in a plant especially during screening and management studies. There are no comprehensive studies on this. Hence, the present research was undertaken to evaluate the population distribution of thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) in rose plant within different plant parameters.

2. Materials and Methods
"Population distribution of thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) in rose plant within plant canopy" was carried out at Bangalore during the year 2008 at University of Agricultural Sciences, GKVK, Bangalore and Poly house, Ramohally, Bangalore

2.1 Thrips distribution on shoots
To estimate thrips population on shoots of different age *viz.*,, young (5-20 days old), matured (>20-45 days old) and old matured (>45 days old) each of 15 cm length comprising leaves of three categories *viz.*,, tender/young, matured and old foliage, respectively were sampled at fields and polyhouses. Observations were taken at fortnightly intervals during January to June, 2008. Five plants were taken randomly on each observation date. On each plant, shoots of different aged groups were sampled. Shoots were tapped separately five times against black card board sheet (37 cmX53 cm) and thrips falling on the sheet were counted separately for different aged groups. Thrips density was averaged for five plants on each observation date for each age group separately. The data was subjected to correlation analysis.

2.2 Thrips density in flowers
To determine distribution of thrips numbers on different floral groups *viz*., young buds (un opened bud of 2-5 days old), calyx opened buds (6-10), freshly opened flowers(1-5days old) and fully matured flowers(>5 days old) were selected for sampling of thrips in field and polyhouse during June to October, 2008. Fortnightly observations were taken. On each observation date, five plants were taken randomly. In each plant, five different floral groups were sampled separately. Each age group was tapped against black card board sheet (30 cm X30 cm) separately five times and thrips numbers were counted and averaged per floral group on each plant under each group. The thrips numbers were averaged for each group per plant (mean of 5 plants). The data were subjected to correlation analysis.

2.3 Within plant preference
To determine thrips preference for different parts of the rose plant, six plant parameters *viz*., young shoot (5-20days old), matured shoot (>20-45days old), old shoot (>45days old), young buds (un opened bud of 2-5 days old), calyx opened buds (6-10), freshly opened flowers (1-5days old) and fully matured flowers (>5 days old) were sampled and number of thrips present on each part was recorded. Observations were taken at fortnightly intervals June to October, 2008 in field and polyhouse. During each observation, five plants were taken. On each plant, each parameter was recorded on five samples and thrips density was counted and data were averaged for five plants. The average was calculated for each stage. The data were subjected to correlation analysis.

2.4 Thrips distribution on plant canopy
To estimate thrips population at different canopy levels of the plants, young shoots at different canopy levels both in field and polyhouses were observed. The plant was divided into three canopies *viz*., bottom (0-50cm from bottom soil level), middle (>50-100 cm from bottom soil level) and top (>100cm from bottom soil level). Observations were taken at fortnightly intervals during January to May, 2008. Five plants were taken randomly on each observation date and thrips numbers were averaged (adults and larvae) on each observation date per plant for different canopy level. Five young shoots in each plant at different canopy levels were tapped separately each five times against black card board sheet (37 cm X53 cm) and are pooled and averaged. The data were subjected to correlation analysis.

2.5 Statistical analysis
Data recorded during the present study period on various aspects were analyzed using MSTAT-C statistical software. Statistical Method by [10] was referred for statistical analysis. The treatment effects were confirmed with the help of mean for comparison of means of different parameters. Regression analysis was made to know the effect of plant parameters on thrips population [4].

3. Results and Discussions
Results of the present of the present study are presented and discussed in this chapter.

3.1 Thrips distribution on shoots
When thrips densities on different aged shoot were compared between young, matured and old, it was observed that young shoot contained more number of thrips (Table 1) than matured and old shoots. Total number of thrips showed a very strong and positive relationship with thrips present on young and matured leaves (r = 0.97 and 0.83, respectively). However, number of thrips present on older leaves did not exhibit such relationship with total number of thrips (r = 0.02). In polyhouse also same result was obtained, young and matured leaves contained more thrips than the old leaves and the relationship as positive (r = 0.92, 0.66 and -0.27, respectively) (Table 1). Hence it can be concluded that while sampling thrips on shoots, young shoot shoots will be more reliable. This result is in confirmatory with Bergh *et al*.,1997 [2] who reported that thrips infestation levels were high on younger leaves and with Jayanthi and Verghese [5] who reported that thrips on tender leaves found suitable to estimate thrips numbers as the variability in the thrips population can be explained to the tune of 98%.

3.2 Thrips distribution on flowers
Thrips density on different aged floral components *viz*., young buds, calyx opened buds, matured opened flowers and fully opened flowers showed that maximum number of thrips were harvested from matured flowers (Table 2). Total number of thrips showed a very strong and positive relationship with matured flower (r = 0.91) compared to unopened bud, calyx opened bud, matured flower and old flower (r =0.60, 0.58, 0.91 and 0.85, respectively) (Table 2). In polyhouse, fully opened flowers had maximum positive relationship with (r= 0.94) compared to matured flower (r = 0.92) (Table 2). Hence, both matured and fully opened flowers can be taken for thrips density sampling. Because of the undisturbed, controlled environment in polyhouse, thrips count were more in fully opened flower, unlike in field wherein thrips density was disturbed in fully opened flowers, especially by wind. Hence maximum count was in matured flowers in open field and both fully opened and matured flower polyhouse.

3.3 Within plant preference
Total number of thrips showed a very strong, positive relationship with thrips numbers present on matured flower and young shoot (r= 0.96and 0.90, respectively) in field. Number of thrips present on matured shoot and fully opened flower also exhibited strong positive relationship with total thrips numbers (Table 3). Regression equation also showed that matured flower and young shoot were the best representative of the thrips density and were reliable sampling unit (R^2 value for young shoot =0.80, matured shoot = 0.53, old shoot= 0.06, unopened bud= 0.23, calyx opened bud= 0.17 and matured flower=0.91 and fully opened flower=0.60) (Fig. 1 and 7). In polyhouse, total number of thrips showed strong positive relationship with fully opened flower, matured flower and young shoot (r = 0.94, 0.93 and 0.92, respectively) (Table3). Hence it can be concluded that while sampling of thrips matured flowers can be taken. However, during non-flowering time, young shoots can be taken for effective thrips count. Regression equation also showed matured flower is best representative of the thrips density and is a reliable sampling unit (R^2 value for matured flower =0.91). Hence, it can be concluded that while sampling of thrips, matured flowers are the best unit of sampling. However, during non-flowering time, young shoots can be taken for effective thrips count (R^2 value for young shoot =0.80). These results are in confirmatory with Jayanthi and Verghese, 2008 [2] who reported that young parts are more preferred by thrips.

3.4 Thrips distribution on canopy
Thrips density on different canopy viz. bottom, middle and

top clearly showed maximum thrips on top canopy compared to middle and bottom canopy both at field and polyhouse. However, correlation analysis showed that all the three canopies were positively contributing to total thrips population (r = 0.95, 0.97 and 0.88 in field and 0.97, 0.90 and 0.96 in polyhouse for upper, mile and lower canopies, respectively) (Table 4). Hence it can be concluded that while sampling, shoots of any canopy can be taken. Even though maximum thrips were harbored on top canopy, correlation analysis showed that all the three canopies were positively contributing to total thrips both in field and polyhouse. But this in contradictory with the statement of that of Rani and Sridhar, 2003 [9] who reported that spraying only upper canopy of the rose plants is adequate for control of thrips which will reduce the chemical cost and its load to environment. However, with the present study, while taking sampling and spraying all the canopies should be considered equally for better result.

Table 1: Thrips density on different aged shoots of rose plants, 2008

Age of shoots	Open field		Age of shoots	Polyhouse	
	**Mean of 10 observations from January to May at fortnightly intervals ± SD	Correlation Value for total thrips		**Mean of 10 observations from January to May at fortnightly intervals ± SD	Correlation Value for total thrips
Young	32.37 ±8.22	0.97*	Young	42.72 ±8.95	0.92*
Matured	21.98 ±4.06	0.83*	Matured	22 ±3.64	0.66*
Old	3.25 ±0.68	0.02	Old	4.65 ±1.03	-0.27
Total			Total		

* Significant at 5% level.
**Average thrips/five plants/five shoot on each plant.

Table 2: Thrips density at different aged floral groups of rose plants, 2008

Age of floral group	Open field		Age of floral group	Polyhouse	
	**Mean of 10 observations from June to October at fortnightly intervals ± SD	Correlation Value for total thrips		**Mean of 10 observations from June to October at fortnightly intervals ± SD	Correlation Value for total thrips
Unopened Bud	6.23 ±1.38	0.60*	Unopened Bud	7.36 ±0.97	0.35
Calyx opened bud	10.26 ±2.47	0.58*	Calyx opened bud	11.9 1±2.53	0.73*
Matured flower	18.41 ±2.87	0.91*	Matured flower	23.21 ±3.76	0.92*
Fully opened flower	14.30 ±2.48	0.85*	Fully opened flower	18.35 ±3.14	0.94*

*Significant at 5% level.
**Average thrips/five plants/five floral parts

Table 3: Thrips density on different plant parameters on rose plants, 2008

Plant parameters	Open field		Plant parameters	Polyhouse	
	**Mean of 10 observations from June to October at fortnightly intervals ± SD	Correlation Value for total thrips		**Mean of 10 observations from June to October at fortnightly intervals ± SD	Correlation Value for total thrips
Young shoot	14.99 ±2.61	0.90*	Young shoot	16.69 ±3.34	0.92*
Matured Shoot	12.39 ±3.43	0.73*	Matured Shoot	14.28 ±2.43	0.74*
Old Shoot	3.25 ±0.68	-0.25	Old Shoot	5.01 ±1.38	-0.70
Unopened Bud	6.23 ±1.38	0.48	Unopened Bud	7.36 ±0.97	0.31
Calyx opened bud	10.26 ±2.47	0.42	Calyx opened bud	11.91 ±2.53	0.71*
Matured flower	18.41 ±2.87	0.96*	Matured flower	23.44 ±4.05	0.93*
Fully opened flower	14.30 ±2.48	0.78*	Fully opened flower	19.06 ±3.71	0.94*

*Significant at 5% level.
**Average thrips/five plants/five parameter

Table 4: Thrips density at different canopy levels of rose plants, 2008

Plant Canopy	Open field		Plant Canopy	Polyhouse	
	**Mean of 10 observations from January to May at fortnightly intervals ± SD	Correlation Value for total thrips		**Mean of 10 observations from January to May at fortnightly intervals ± SD	Correlation Value for total thrips
Upper	26.08 ±6.77	0.95*	Upper	34.03 ±5.28	0.97
Middle	23.42 ±7.40	0.97*	Middle	29.35 ±6.49	0.90*
Lower	16.39 ±5.00	0.88*	Lower	29.4 ±9.44	0.96 *
Total			Total		

* Significant at 5% level.
**Average thrips/five plants/five young shoot on each canopy

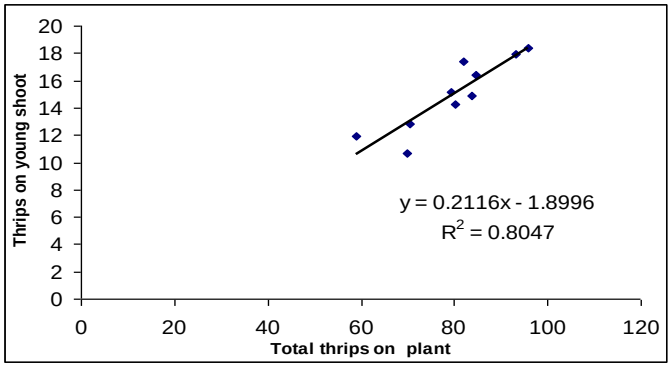

Fig 1: Relation between total thrips and thrips present on young shoot

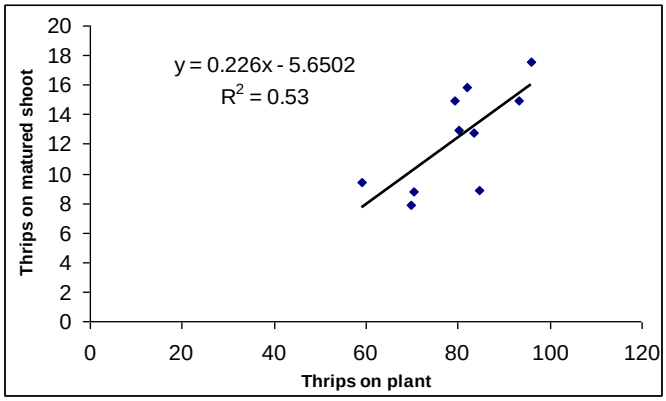

Fig 2: Relation between total thrips and thrips present on matured shoot

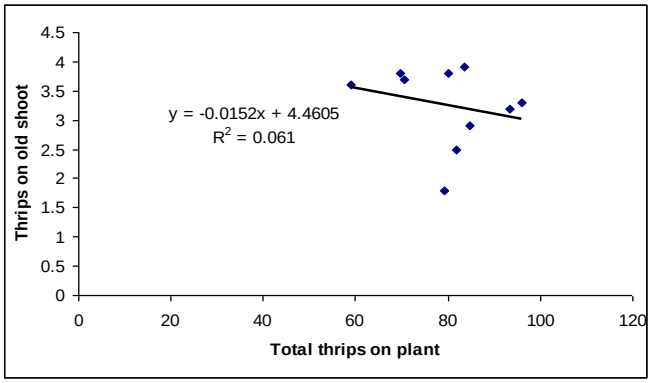

Fig 3: Relation between total thrips and thrips present on old shoot

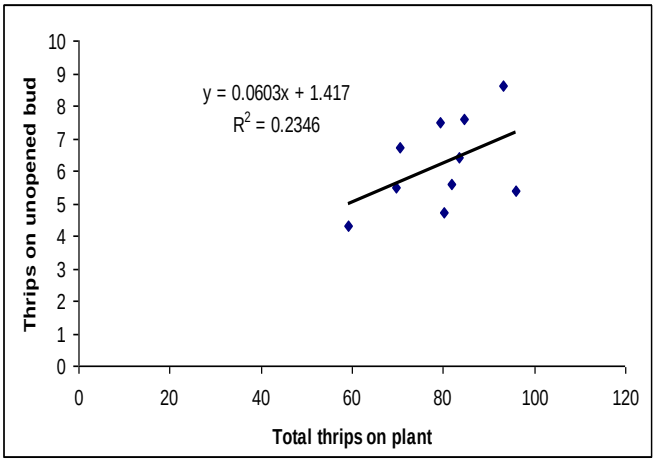

Fig 4: Relation between total thrips and thrips present on unopened bud

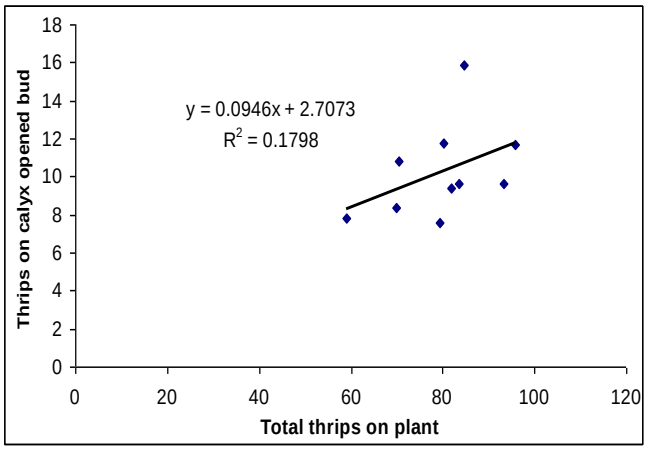

Fig 5: Relation between total thrips and thrips present on calyx opened bud

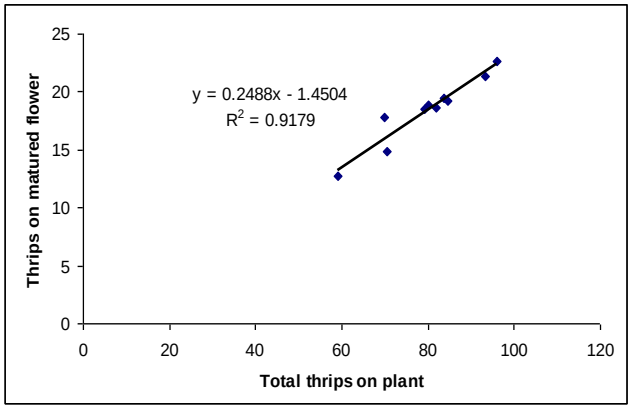

Fig 6: Relation between total thrips and thrips present on matured flower

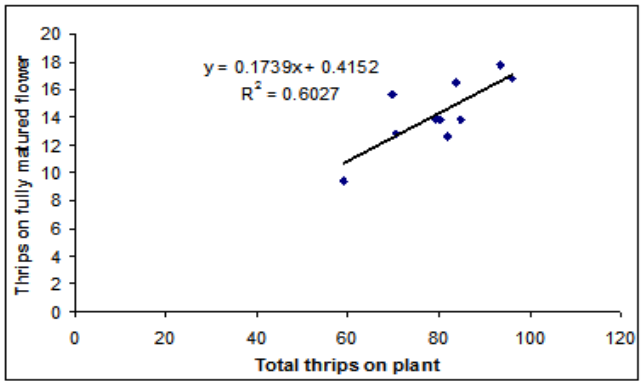

Fig 7: Relation between total thrips and thrips present on fully matured/ fully opened flower

4. Conclusion

From the present study, it was found that matured flower and young shoot (r = 0.96 and 0.90, respectively) at all the canopy levels were most preferred plant parts for the thrips. They serve as the best sampling unit for sampling the population of thrips. Hence, while sampling for thrips, matured flowers of any canopy are most reliable parameter. However, during non-flowering time, young shoots of any canopy can be taken for effective thrips count.

5. Acknowledgement

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